



Standard Operating Procedure: Blood Collection in Swine

These SOPs were developed by the Office of the University Veterinarian and reviewed by Virginia Tech IACUC to provide a reference and guidance to investigators during protocol preparation and IACUC reviewers during protocol review. They can be used as referenced descriptions for procedures on IACUC protocols.

However, it is the sole responsibility of the Principal Investigator to ensure that the referenced SOPs adequately cover and accurately represent procedures to be undertaken in any research project. Any modification to procedure as described in the SOP must be outlined in each IACUC protocol application (e.g. if the Principal Investigator plans to use a needle size that is not referenced in the SOP, simply state that alteration in the IACUC protocol itself).

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I. Procedure Summary and Goal

Describes procedures for blood collection in swine.

Considerations:

Refer to SOP: Swine Restraint for methods of restraint.

Easily performed without general anesthesia, but proper restraint required.

Handlers should be vigilant at all times so as to avoid injury to animals or themselves.

- a. Blood volume collection determination
 - i. See Guidelines for Regulating the Volume of Experimental Blood Sample Withdrawals in Laboratory Animals
 1. Circulating blood volume (CBV) should be determined from known species specific volume to weight values and not calculated based on flat percentage of body weight
 2. A maximum survival bleed not exceeding 10% of CBV is allowable once monthly
 3. Bleedings performed weekly should not exceed 7.5% of CBV
 4. Animals being bled daily may have 1% of CBV taken
 5. Exceptions to these numbers are possible with fluid replacement therapy
- b. Pig Estimated Circulating Blood Volume = 70ml/kg
 - i. Example: 40kg pig: $CBV = 20\text{kg} \times 70\text{ml/kg} = 1400\text{ml}$. Maximum one time survival withdrawal (without fluid supplementation) = $0.10 \times 1400 = 140\text{ml}$

II. Personal Protective Equipment (PPE) and Hygiene

- a. Ensure appropriate PPE is used to protect handler from accidental injury or exposure to blood and other body fluids, such as:
 - i. Scrubs or coveralls
 - ii. Steel-toed shoes or boots
 - iii. Optional
 1. Disposable gloves (e.g., latex, nitrile)
 2. Eye protection
 - iv. Other PPE as required by protocol/facility
- b. Hands should be washed and/or gloves changed between animals; if vacutainer hubs used, ideally they should be disinfected between barns or housing facilities.

- c. Promptly dispose of used sharps in the provided leak-proof, puncture resistant sharps container.

III. Supply List

- a. Blood collection vials (e.g., syringes, vacutainer tubes)
- b. Needles or vacutainer needles and hub

| Needle Selection Guide for Blood Collections | | |
|--|----------|--------------|
| SIZE OF PIG | GAUGE | LENGTH |
| Baby Pigs (up to 25kg) | 20 | ¾ - 1 inch |
| Grower (25 to 70kg) | 18 | 1½ inch |
| Finisher/Breeders (>70kg) | 14 to 16 | 1 to 2 inch* |
| * for Anterior Vena Cave, use 4-inch length | | |

- c. Restraint (e.g., snare, v-trough, sling, crowd panels)
- d. Antiseptic
- e. Gauze

IV. Detailed Procedure

- a. Anesthesia
 - i. No anesthesia needed, but adequate restraint required.
- b. Anatomy (Figure 1)
 - i. Jugular vein (A)
 - ii. Anterior Vena Cava (B)
 - iii. Heart (C)
 - iv. Auricular vein (D)
- c. Procedure for blood collection
 - i. Restrain animal with snare, securely contained against a wall or corner; alternatively, swine can be placed in a sling, smaller pigs can be held or placed in v-trough.
 - ii. Clean as needed to remove superficial dirt and debris.
 - iii. For jugular collection: locate jugular furrow, and align with point of the shoulder and point of the manubrium. With bevel up, insert needle perpendicular to the skin (Figure 2).
 - d. If using vacutainer, once needle inserted, stabilize needle and push the vacutainer tube into hub. If you have hit the vein, blood will flow freely into tube. Multiple tubes can be filled by removing filled tube and replacing with fresh tube.

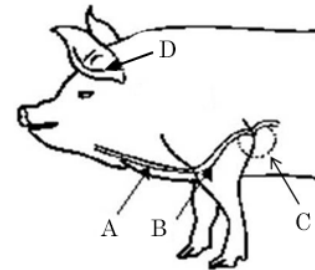


Figure 1. Common Sites for Venipuncture



Figure 2. Blood Collection from Jugular Vein using Vacutainer Set-up

NOTE: Do not pull needle out of vein with vacutainer tube still attached as this will release the vacuum in the vacutainer.

- e. If you have missed the vein, you can carefully reposition needle, with vacutainer attached, until vessel penetrated. The vessel is fairly deep and may roll away from needle. Typically no more than two to three attempts should be made at a time to minimize distress to the animal and potential damage to the vein.
- f. Alternately, you can use needle and syringe. Break the seal on the syringe by gently pulling back before using. Clear air, and with needle attached to syringe, insert firmly needle at 90° angle, and aspirate syringe to confirm insertion and collect blood.
- g. Once collection complete, remove vacutainer tube, then, applying pressure over injection site, remove needle.
- h. Dispose of needle in approved Sharps container.
- i. In order to ensure adequate hemostasis, apply pressure for 30 to 60 seconds.

V. Variations

- a. Anterior vena cava (Figure 3)
 - i. Using same technique as listed above, with a needle up to 4 inches in length.
 - ii. Insert the needle alongside the breastbone at approximately 90°, directed slightly inwards towards the spine.
 - iii. Insert straight in, and remove needle slowly in same manner in order to avoid lacerating the vessel.
 - iv. In order to ensure adequate hemostasis, apply pressure with gauze for 30 to 60 seconds.



Figure 3. Blood Collection via Anterior Vena Cava with Needle and Syringe

VI. Potential Adverse Effects, Mitigation, or Treatment

- a. Hematoma or thrombus
 - i. Enter vessel at an angle of 30 degrees or less
 - ii. Use a gauge of needle smaller than the vein
 - iii. Apply pressure until bleeding has stopped (1+ minutes)
- b. Pain at blood collection site
 - i. Use a needle of smaller gauge than the vein
 - ii. Practice on vein models prior to live animal
- c. Infection at blood collection site
 - i. Use sterile single-use devices only
 - ii. Clean work surfaces with disinfectant
 - iii. Wear gloves, wash hands
 - iv. Contact a qualified veterinarian for treatment recommendations if any of the following are noted.
 1. Heat, pain, swelling first noted at the insertion site of the blood draw, purulent material draining from the insertion site.
 2. Induration (hardening) of the vessel
 3. Stiff, swollen neck
 4. Pyrexia, local or systemic infections, septic shock
- d. Syncope, shock, death
 - i. Secondary to vasovagal response
 1. Contact veterinary staff immediately
 - ii. Secondary to laceration of anterior vena cava or jugular vein

1. Contact veterinary staff immediately

VII. References

American Association of Laboratory Animal Science. Assistant Laboratory Animal Technician Training Manual. (Memphis, TN: Drumwright and Co, 2012)

Bollen, P., Hansen, A., and Rasmussen, H. The Laboratory Swine. (Boca Raton, FL: CRC Press LLC, 2002)

Holtgrew-Bohling, K. Large Animal Clinical Procedures for Veterinary Technicians (2nd ed.). (St. Louis, MO: Elsevier Mosby, 2012)

McCurnin, D., and Bassert, J. Clinical Textbook for Veterinary Technicians (5th ed.). (Philadelphia, PA:Saunders Elsevier 2002)